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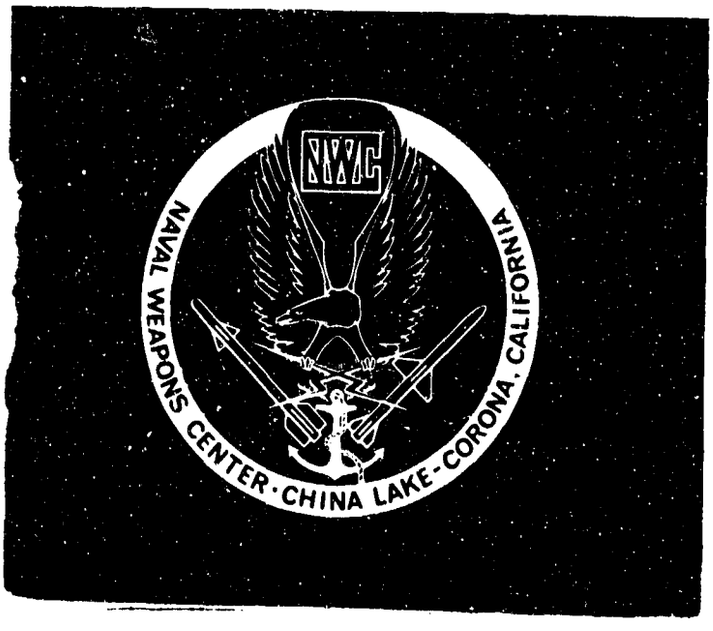

NAVAL WEAPONS CENTER
AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

CONTENTS

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NAVAL WEAPONS CENTER
AN ACTIVITY OF THE NAVAL MATERIAL COMMAND
W. B. Etheridge, CAPT, USN, Commander
Thomas S. Amlie, Ph.D., Technical Director

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PREFACE

This booklet has been prepared by the Technical Information Department to make readily available the titles and abstracts of unrestricted publications by employees of the Naval Weapons Center issued during 1968. It lists official publications released to the Clearinghouse for Federal, Scientific, and Technical Information for dissemination under Public Law 776, professional papers published in the open literature, and U.S. Patents. It is hoped that this booklet will contribute to the cross-fertilization of ideas and the elimination of unnecessary duplication of effort.

The official publications are listed by series number (NWC or NWCCL TP); the professional papers alphabetically by first author; and the patents by U.S. Patent Number. An author index appears at the end.

Part 3 of the *Naval Weapons Center Technical History 1968* (NWC TP 4680, Part 3) records all the technical publications of this Center issued during the year. In addition to the listing herein, it includes official publications of limited distribution, technical motion pictures, and Navy patent cases under secrecy order. These are available to persons with established need-to-know through the channels for classified information.

Additional copies of this booklet are available in the NWC Technical Library (Code 753), in the Corona Laboratories Technical Library (Code 2034), and from the Distribution Office (Code 7506). Requests originating outside NWC should be directed to the Commander (Code 7506), Naval Weapons Center, China Lake, Calif. 93555.

Under authority of
THOMAS S. AMLIE
Technical Director

Released by
K. H. ROBINSON, *Head*
Technical Information Department
23 April 1969

OFFICIAL PUBLICATIONS

NWC Technical Publication 4501

Geologic Evaluation of San Clemente Island as a Location for a Rock-Site I Installation, by C. F. Austin. China Lake, Calif., NWC, March 1968. 28 pp. UNCLASSIFIED.

ABSTRACT. San Clemente Island has been studied to determine the geologic suitability of employing the island as a candidate site for the construction of a Rock-Site I installation, the land-linked experimental laboratory. The studies of the island consisted of a review of the geologic literature, aerial reconnaissance, geologic mapping, core drilling, borehole pumping, and offshore geophysical studies and sampling operations. Based on the results of these investigations the recommendation is made that the laboratory area beneath the sea floor be located off Mail Point with access tunnels to the laboratory originating at either Mail Point or Lost Point. Although Rock-Site I laboratory construction is believed to be technically feasible at San Clemente Island, the proposed undersea installations will encounter major inflows of saline water from the volcanic host rock, requiring grouting or other water control measures; the access to the water mass will be limited to either shallow shelf areas or to water depths of the order of 1,250 feet or more because of sediments in the offshore areas; and site engineering will be hampered by the apparent steep seaward dip that develops in the offshore andesites. As a candidate site, San Clemente Island is considered to be feasible but difficult.

NWC Technical Publication 4503

Subvex Functions and Bohr's Uniqueness Theorum, by Roy Leipnik and R. Oberg. China Lake, Calif., NWC, March 1968. 4 pp. UNCLASSIFIED.

ABSTRACT. A new proof, based on asymptotic convexity, is obtained for Bohr's theorem on the uniqueness of solution of the difference equation for the gamma function.

NWC Technical Publication 4519

Closed-Loop Evaluation of a ±7-Bit Digital Servovalve, by C. D. Shah. China Lake, Calif., NWC, March 1968. 126 pp. UNCLASSIFIED.

ABSTRACT. This report is a facsimile of a contractor R&D summary report. It documents the evaluation of a ±7-bit digital electrohydraulic servovalve, used in a closed loop with an actuator as a digital position-control device, and describes the advanced development and production configuration requirements needed to bring the experimental servovalve model to production status.

The closed loop used for the evaluation consisted of the digital servovalve, a linear actuator, a feedback encoder, and rack/pinion mechanization. It provides position output proportional to digital command inputs for eventual use in the control of a missile launcher hydraulic power drive. In operation, the error is calculated (from the digital error signal, which is generated as the difference between the digital command and the feedback) and applied as the command to the digital servovalve. The tests conducted established that the digital valve can be used in a closed-loop configuration to provide digital position control.

The development of the servovalve itself is documented in NOTS TP 3913 and NOTS TP 4298.

NWC Technical Publication 4624

Compilation of Spectral Emittances of Background and Target Constituents in the 8- to 14-Micron Range, by John W. Czarnik and H. P. Leet. China Lake, Calif., NWC, September 1968. 188 pp. UNCLASSIFIED.

ABSTRACT. A search of the unclassified literature for 8 to 14 micron spectral emittance information on infrared background and target materials resulted in a comprehensive compilation that is presented in this report. The report abstracts information published prior to October 1967 and concerns the room temperature spectral dependence of the emittance of various classes of materials. A large amount of data is available in the literature for certain material classes such as metals, paint coatings, and minerals, and representative data is here abstracted. Little information is available for the material classes of foliage, soils, plastics, and other synthetic building materials. All useable reported data on these materials is presented. The selection criteria for the inclusion of data is presented. Techniques commonly used to obtain emittance, absorptance, and reflectance data are outlined. A bibliography of open literature reports containing emittance data is presented.

NWCCL Technical Publication 782

Horizontal End-Loaded VLF Transmitting Antenna, by E. W. Seeley and W. K. Moision. Corona, Calif., NWCCL, June 1968. 49 pp. UNCLASSIFIED.

ABSTRACT. A comparison is made of the theoretical and experimental performances of a small, easily constructed, VLF transmitting antenna. It is a horizontal end-loaded multiple-dipole antenna which takes advantage of the earth's conductivity. Radiation efficiency, input impedance, bandwidth, and long range field strength measurements were made; phase and amplitude stabilities of the radiated field were measured during rainstorms; and multiple-frequency resonance tuning was investigated. The radiation efficiency of the experimental dipole is modest but is increased considerably by the addition of parallel dipoles. The bandwidth is very high (25%), and the power radiation capability is far above that of any other type of VLF transmitting antenna.

PROFESSIONAL PAPERS

OL 1212

Adicoff, A., and A. A. Yukelson. "Torsional Braid as a Kinetic Tool for the Study of the Polymerization of Viscous Materials. II. Catalytic Effects in the Polymerization of Carboxylic Acid-Terminated Polybutadiene Prepolymers with Tris[1-(2-methyl)aziridinyl] phosphine Oxide," J APPL POLYMER SCI, Vol. 12, No. 8 (August 1968), pp. 1959–65.

ABSTRACT. The torsional braid technique for studying the polymerization of viscous substances has been extended to a study of the homogenous catalytic behavior of a number of acidic and basic catalysts in the polymerization of carboxy-terminated polybutadiene with tris(methyl aziridinyl)phosphine oxide. No general catalytic behavior was observed. Specific catalysis was observed in the case of lithium oleate, where the gel time was decreased, and in the case of bis(tri-n-butyltin) oxide, where the gel time was increased. The average energy of activation for all of these polymerizations was 13.9 ± 0.5 kcal./mole. This energy of activation and the reaction environment, when compared with the data in the literature, strongly suggest that the explanation that a change in the rate-determining step occurs as a function of the polarity of the reaction medium fails to account for all of the results.

OL 1213

Alltop, W. O. "Free Planes and Collineations," CAN J MATH, Vol. 20 (1968), pp. 1397–1411.

ABSTRACT. This paper consolidates and extends previously known results regarding free projective planes in order to facilitate the study of their collineation groups. An upper bound m_n for the orders of the finite subgroups of G_n is established, where G_n is the collineation group of the free plane F_n of rank n+4.

OL 1214

Alltop, W. O., A. V. Pratt, and R. C. Burton. "Algebraic Theory of Flip-Flop Sequence Generators," INFORM AND CONTR, Vol. 12 (1968), pp. 193–205.

ABSTRACT. The problem of constructing linear shift registers with a minimum number of adders has provoked interesting research on the theory of trinomials over the field with two elements. Each adder which can be eliminated significantly increases the speed at which the sequence can be generated, and linear shift registers corresponding to trinomials have only one adder. In this paper we describe a class of sequence generators employing J-K flip-flops in place of the usual delay elements, and which require no adders or additional gating. J-K flip-flops operate at a speed comparable to that of delay elements. If n is the number of flip-flops, then for n = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 17, and 18 a sequence of period 2^n-1 can be generated. This sequence is linear and has the well-known randomness and correlation properties. A table in the final section of this paper gives the periodic structure for all n ≦ 19.

OL 1215

Austin, Carl F. "Manned Undersea Installations," presented at the ASCE Conference, San Francisco, 6–8 September 1967.

OL 1216

Austin, Carl F. "Rock Site Undersea Construction," Northeast Regional Meeting Proceedings, Washington, D. C. The Society of the American Military Engineers, 1967. pp. 18–23.

OL 1217

Austin, C. F. "Rock Site--A Way Into the Sea," Sea Frontiers, Vol. 13, No. 6 (November-December 1967), pp. 342–52.

OL 1218

Bauer, E. "On the Nature of Annealed Semiconductor Surfaces," PHYS LETT, Vol. 26A, No. 11 (April 1968), pp. 530–31.

ABSTRACT. The combination of low energy electron diffraction and Auger electron spectroscopy of annealed Si(111) surfaces indicates that the surface structures previously attributed to clean surfaces are associated with very thin reaction layers.

OL 1219

Beckstead, M. W., and T. L. Boggs. "The Effect of Oxidizer Particle Size on Nonacoustic Instability," in 4th Combustion Conference, Interagency Chemical Rocket Propulsion Group, comp. and ed. by Chemical Propulsion Information Agency. Silver Spring, Md., CPIA, December 1967. CPIA Pub. No. 162, Vol. 1, pp. 337–46.

ABSTRACT. This paper presented a "layer frequency" concept which explained certain combustion instability anomalies which occurred between the

normally used one-dimensional thermal wave analysis and the data obtained from a series of propellants having a bimodal ammonium perchlorate particle size when fired in the L* burner. This layer frequency concept also predicted a dual frequency, i.e., two frequency regimes, which could be positively correlated with the particle sizes used in a particular propellant.

OL 1220

Beckstead, M. W., and F. E. C. Culick. "A Comparison of Analysis and Experiment for the Response Function of a Burning Surface," in 4th Combustion Conference, Interagency Chemical Rocket Propulsion Group, comp. and ed. by Chemical Propulsion Information Agency. Silver Spring, Md., CPIA, December 1967. CPIA Pub. No. 162, Vol. 1, pp. 331–36.

ABSTRACT. This paper examines data obtained from both L* and T-burners and compares it to the theoretical response function

$$\frac{r'/\bar{r}}{p'/p} = \frac{m'/\bar{m}}{p'/p} = R = \frac{nAB}{\lambda + \frac{A}{\lambda} - (1+A) + AB}$$

On the basis of this comparison it was deduced that the existing analyses of the response function for a solid propellant are inadequate and that the assumptions made in deriving the response functions are at fault.

OL 1221

Bennett, H. E., J. M. Bennett, E. J. Ashley, and R. J. Motyka. "Verification of the Anomalous-Skin-Effect Theory for Silver in the Infrared," PHYS REV, Vol. 165, No. 3 (January 1968), pp. 755–64.

ABSTRACT. The measured infrared reflectance of silver films prepared by rapid evaporation in ultrahigh vacuum was found to be in excellent agreement (0.1%) with values predicted by the anomalous skin effect theory in the wavelength region from 4-24 μ (values of $\omega\tau$ between 15 and 2, where τ is the relaxation time). If a small correction term was included for electron-electron collisions, the agreement could be extended to 1 μ ($\omega\tau \simeq 50$). The theoretical curves were determined from values of dc conductivity and Hall constant measured on silver films prepared in the same evaporation as the optical samples. No optical data were used to fit the calculated curves to the experimental data. Silver films of varying degrees of roughness were prepared by evaporating silver onto supersmooth fused-quartz optical flats which had been roughened with calcium fluoride films. It was found that there was no difference between the infrared reflectance of rough and smooth silver samples for roughnesses up to 45 Å rms. Thus $p \simeq 1$, a condition usually interpreted as specular reflection of the conduction electrons, for surfaces about an order of magnitude rougher than the value predicted by simple diffraction theory. For rougher surfaces, p dropped rapidly to 0 and, for the roughest surfaces studied (~100 Å rms), the reflectance was somewhat lower than that predicted theoretically.

OL 1222

Bens, Everett M., and Charles M. Drew. "Diatomaceous Earth: Scanning Electron Microscope of 'Chromosorb P'." Nature, Vol. 216, No. 5119 (December 1967), pp. 1046–48.

ABSTRACT. The scanning electron microscope is used to illustrate the variety of particles and diatoms present in the diatomaceous earth used as an "inert" support for gas chromatography. The kind, number, and size of the holes can be determined in specific diatoms found in Chromosorb P. The effect of the holes on gas chromatographic column performance and filtration effectiveness can be estimated as well as the reasons for the high surface area of this support.

OL 1223

Bergman, T. G., and J. L. Thompson. "An Interference Method for Determining the Degree of Parallelism of (Laser) Surfaces," APPL OPT, Vol. 7, No. 5 (May 1968), pp. 923–25.

ABSTRACT. A method for measuring the angle between two nearly parallel surfaces is presented. Convenient to use, the method has ample brightness and sensitivity for use in aligning the various surfaces often found in laser cavities. A cw laser is focused to provide a point source of light which illuminates the two surfaces in question. The reflected light beams form an interference pattern from which the angle between the surfaces can be easily measured. A simple equation is given relating the fringe position to angular separation.

OL 1224

Bilbo, A. J., C. M. Douglas, N. R. Fetter, and D. L. Herring. "Synthesis and Thermogravimetric Analysis of Diol-Linked Tetrameric Hexaphenyldichlorophosphonitrile Polymers," J POLYMER SCI A-1, Vol. 6 (1968), pp. 1671–85.

ABSTRACT. Several high molecular weight polymers have been prepared from the reactions of hexaphenyldichlorophosphonitrile tetramer with *p,p'*-biphenol, 4,4'-oxydiphenol, resorcinol, and benzidine. A simple fractionation procedure yielded samples of the biphenol-linked polymer with molecular weights of approximately 500,000. DTA and TGA studies of this polymer in a variety of envrionments indicate thermal degradation is initiated in the phosphonitrile ring.

OL 1225

Bottka, N., and U. Roessler. "Electroreflectance Near Anisotropic Interband-Edges," SOLID STATE COMMUN, Vol. 5 (1967), pp. 939–43.

ABSTRACT. We report here on electroreflectance near anisotropic interband edges in cubic crystals. Assuming ellipsoids and hyperboloids of revolution for the interband energy surfaces, contributions from the different critical points in the Brillouin zone of the same symmetry to $\Delta R/R$ is considered.

OL 1226

Buecher, R. W., R. R. Lindemann, and N. W. Rees. "Identification of the Dynamic Characteristics of a Pneumatic Servo System," presented at the First Asilomar Conference on Circuits and Systems, Pacific Grove, Calif., 1–3 November 1967.

ABSTRACT. This paper describes two practical identification techniques for estimating in a least squares sense the describing characteristics of linear dynamic systems.

The first technique determines the sampled impulse response of the system by cross-correlation using pseudorandom binary test signals, whilst the second technique identifies the coefficients of the system difference equation representation using a recursive updating computer algorithm.

Application of both these schemes to identify the dynamic characteristics of a pneumatic servo system is described, with results from both methods and a comparison of the methods given. Some detail of the experimental setup and experimental difficulties is described.

OL 1227

Clawson, Arthur R. "Back-Reflection X-Ray Diffraction of Selected Small Areas," REV SCI INSTRUM, Vol. 39, No. 4 (April 1968), pp. 597–98.

OL 1228

Colberg, S. R. "Digital Method of Measuring Exponentially Decaying Signals," Note, REV SCI INSTRUM, Vol. 39, No. 1 (January 1968), pp. 133–36.

OL 1229

Conger, R. L., L. T. Long, and J. A. Parks. "Synthesis of Fresnel Diffraction Patterns by Overlapping Zone Plates," APPL OPT, Vol. 7 (April 1968), p. 623.

ABSTRACT. It has been shown previously that two overlapping circular zone plates will create the image of two separate zone plates, two circular dots of light, with the closeness of the dots proportional to the degree of overlap of the zone plates. It is shown here that more complicated patterns can be produced by superpositioning of zone plate sections if the zone plates are cut so that the same number of sections overlap in each area.

OL 1230

Cordes, Herman F. "The Preexponential Factors for Solid-State Thermal Decomposition," J PHYS CHEM, Vol. 72, No. 6 (June 1968), pp. 2185–89.

ABSTRACT. The preexponential factors for both unimolecular and bimolecular solid-state thermal decompositions are analyzed from the point of view of activated complex theory. The effect of molecular rotation in both the reactants and the activated complex is considered. If the activated complex has freer rotation than the reactant, the first-order preexponential factor is high. In the bimolecular case, the activated complex is likely to have restricted rotations leading to very low pseudo-first-order preexponential factors. This approach is compared with other treatments.

OL 1231

Cordes, Herman F., and S. Ruven Smith. "The Thermal Decomposition of Solid Alkali Perchlorates," J PHYS CHEM, Vol. 72, No. 6 (June 1968), pp. 2189–94.

ABSTRACT. The solid-phase thermal decompositions of Na, K, Rb, and Cs perchlorates have been studied between 350 and 500°, at low percentage decomposition. The major products are O_2 and ClO_3^-. The decomposition rates were determined by direct measurement of the O_2-evolution rate using a Bendix time-of-flight mass spectrometer. All four salts have nearly the same rate of decomposition below 410°. Above 410° the rate of $NaClO_4$ is abnormally high. The results are interpreted in terms of a homogeneous, bimolecular solid-phase reaction between neighboring ClO_4^- ions. A detailed model of the activated complex is discussed.

OL 1232

Culick, F. E. C. "A Review of Calculations for Unsteady Burning of a Solid Propellant," AMER INST AERONAUT ASTRONAUT J, Vol. 6, No. 12 (December 1968), pp. 2241–55.

OL 1233

Culick, F. E. C. "Some Nonacoustic Instabilities in Rocket Chambers Are Acoustic."

Technical Notes, AMER INST AERONAUT ASTRONAUT J, Vol. 6, No. 7 (July 1968), pp. 1421–23.

OL 1234

Curry, E. E. "The Analysis of Round-Off and Truncation Errors in a Hybrid Control System," INST ELEC ELECTRON ENG, TRANS, AUTOMAT CONTR, Vol. AC-12, No. 5 (October 1967), pp. 601–04.

ABSTRACT. The round-off and truncation errors of a digital-analog (hybrid) servo system are studied in terms of the least upper bound and second moment, or variance. The study was applied to the azimuth function of a guided missile launcher system and a digital controller designed for the launcher system. The techniques employed can be generalized and applied to other analog-digital or digital systems.

OL 1235

Dehority, G. L., and H. B. Mathes. "Acoustic Response Function Equation for a T-Burner with High Heat Loss," Technical Notes, AMER INST AERONAUT ASTRONAUT J, Vol. 6, No. 4 (April 1968), pp. 741–42.

OL 1236

Diehl, Robert C. "New Management Techniques Evolved in Developing Procedures for Major Weapon System Development Program," NAV MANAGE REV, Vol. 13, No. 4, 5, 6 (April, May, June 1968), pp. 12–15.

OL 1237

Diliberto, Stephen P. "Scale Factors for Periodic Surfaces," SIAM J APPL MATH, Vol. 16, No. 5 (September 1968), pp. 1119–22.

OL 1238

Donovan, T. M., and W. E. Spicer. "Changes in the Density of States of Germanium on Disordering as Observed by Photoemission," PHYS REV LETT, Vol. 21, No. 23 (December 1968), pp. 1572–75.

ABSTRACT. An optical density of states in amorphous Ge derived from photoemission measurements shows that the maximum in the valence-band density of states is shifted 1.5 eV to higher energy with respect to the crystalline density of states. No structure is observed in the conduction-band density of states for the amorphous material, whereas strong structure is presented in the crystalline density of states. Changes observed in the optical properties of Ge on disordering can be explained using these results.

OL 1239

Drew, Charles M. "Chemical Applications of the Scanning Electron Microscope," in Scanning Electron Microscopy, Proceedings, 1968. Chicago, Ill., ITT Research Institute, April 1968. Pp. 106–19.

ABSTRACT. The Naval Weapons Center has established a scanning electron microscope facility in their Research Department for the purpose of providing new capability. Some applications of the instrument to problems of chemistry have been selected and are discussed in this presentation to demonstrate new areas of investigation in which the instrument has made significant contributions. Attention has been given to the special behavior of thin membranes, and some handling techniques are related to chemical applications. Only the emissive mode of SEM has been utilized in these studies, and several pictorial examples have been included under each topic to show typical results.

OL 1240

Drew, Charles M., and Bernadine D. Tschudy. "Aquilapollenites: Fossil Pollen as Seen Under the Scanning Electron Microscope," GEOL SOC AMER, BULL, Vol. 79 (December 1968), pp. 1829–32.

ABSTRACT. Photographs of a Late Cretaceous species of Aquilapollenites illustrate the usefulness of the scanning electron microscope (SEM) for the study of fossil pollen. The SEM has the advantages of great depth of focus and wide range of magnification; using present techniques, its use for the study of unsectioned specimens is limited to the observation of surface detail.

OL 1241

Engel, Albert E. J., Bartholomew Nagy, Lois Anne Nagy, Celeste G. Engel, Gerhard O. W. Kremp, and Charles M. Drew. "Alga-Like Forms in Onverwacht Series, South Africa: Oldest Recognized Lifelike Forms on Earth," Science, Vol. 161 (September 1968), pp. 1005–08.

ABSTRACT. Spheroidal and cupshaped, carbonaceous alga-like bodies, as well as filamentous structures and amorphous carbonaceous matter occur in sedimentary rocks of the Onverwacht Series (Swaziland System) in South Africa. The Onverwacht sediments are older than 3.2 eons, and they are probably the oldest, little-altered sedimentary rocks on Earth. The basal Onverwacht sediments lie approximately 10,000 meters stratigraphically below the Fig Tree sedimentary rocks, from which similar organic microstructures have been

interpreted as alga-like microfossils. The Onverwacht spheroids and filaments are best preserved in black, carbon-rich cherts and siliceous argillites interlayered with thick sequences of lavas. These lifelike forms and the associated carbonaceous substances are probably biological in origin. If so, the origins of unicellular life on Earth are buried in older rocks now obliterated by igneous and metamorphic events.

OL 1242

Fetter, Neil R. "Organoberyllium Compounds," ORGANOMET CHEM REV 3 (1968), pp. 1–34.

OL 1243

Fischer, J. E., and B. O. Seraphin. "Modulated Reflectance at Oblique Incidence," SOLID STATE COMMUN, Vol. 5 (1967), pp. 973–76.

ABSTRACT. This note demonstrates that observation of modulated reflectance at oblique rather than normal incidence increases the analytical potential of the method; the component polarized parallel to the plane of incidence exhibits an 'angular line shape' near the Brewster angle characteristic of the type of critical point involved in the transition.

OL 1244

Fischer, J. E., B. J. Parsons, and H. E. Bennett. "Spurious Observation of Scattered Light in Ultraviolet Instruments," Letter to the Editor, APPL OPT, Vol. 7, No. 4 (April 1968), pp. 715–16.

OL 1245

Fletcher, Aaron N. "Fluorescence Emission Band Shift with Wavelength of Excitation," J PHYS CHEM, Vol. 72, No. 8 (August 1968), pp. 2742–49.

ABSTRACT. Contrary to previous reports, the wavelength position of a fluorescence emission band need not remain fixed with variation of the wavelength of excitation. Certain fluorescent compounds with rotatable auxochromic groups are shown to exhibit a fluorescence band shift (B shift) in numerous solvents. It is postulated that the B shift is due to the fluorescent molecule existing in at least two different "average" conformations, each with its own distinct electronic energy transitions. These conformations can be considered as being stabilized by the interaction of the solvent with the molecule in both its ground and electronically excited states. The B shift then results from the excitation of different proportions of these two conformations. 2-Aminopurine, o,o'-biphenol, 6-ethoxyquinaldine, luminol, 6-methoxyquinaldine, 6-methoxyquinoline, and quinine are shown to have B shifts.

OL 1246

Fletcher, Aaron N., and Carl A. Heller. "The Alcohol Self-Association Dimer and the Adsorption Band(s) near 1.53 μm," J PHYS CHEM, Vol. 72, No. 5 (May 1968), pp. 1839–41.

ABSTRACT. Evidence is presented that indicates that the infrared adsorption at 1.528 μm is due to a combination of O-H and C-H stretch modes of the monomer of aliphatic alcohols. Although an adsorption band at 2.86 μm can be shown as being due to the self-association dimer, the concentration of this dimer is found to be too low to affect the material balance equations of the major self-association species. No dimer adsorption band was observed in the overtone region.

OL 1247

Fry, J. L., H. H. Caspers, H. E. Rast, and S. A. Miller. "Optical Absorption and Fluorescence Spectra of Dy^{3+} in LaF_3," J CHEM PHYS, Vol. 48, No. 5 (1 March 1968), pp. 2342–48.

ABSTRACT. The absorption spectrum of $Dy^{3+}(4f^9)$ in LaF_3 has been observed at 77° and 4.2°K in the 3000–30000-Å wavelength region. The fluorescence spectrum was observed in the range from 4500 to 11000 Å. From an analysis of the observed transitions, it was possible to assign J+½ Stark components for most of the states below 24000 cm^{-1}. The intermediate coupling free-ion energy levels for Dy^{3+} have been calculated including the interactions of all the multiplets of the $4f^9$ configuration. The final least-squares fit, with the inclusion of configuration interaction, gave a mean error of 25 cm^{-1} with the following values for the parameters: $F_2 = 436.5$, $F_4 = 64.12$, $F_6 = 6.566$, $\zeta = 1930$, $\alpha = 28.85$ cm^{-1}. The calculated energy levels and wave-functions below 40000 cm^{-1} are presented and discussed.

OL 1248

Gordon, A. S., C. M. Drew, J. L. Prentice, and R. H. Knipe. "Techniques for the Study of the Combustion of Metals," AMER INST AERONAUT ASTRONAUT J, Vol. 6, No. 4 (1968) pp. 577–83.

ABSTRACT. Only small metal particles with high heats of combustion are of interest in propellants. The self-sustained combustion of metal occurs at high temperatures, making details of the process difficult to measure. High response instrumentation such as streak and high speed photography, and spectroscopic methods are employed to obtain information on the kinematics of combustion. Further combustion details are obtained by quenching the burning configuration which can be studied using optical and electron microscopy, including scanning electron microscopy.

The experimental results point out shortcomings in the combustion model in current use. The mechanism of the ignition is of great importance, both in engineering practice and in research studies, since the products of preignition reaction can remain on the surface and affect the subsequent self-sustained burning. Ignition has been investigated using hot gases, electrically heated wires, and flash radiation. The physical properties of the metal and its products determine the mechanism of the reaction. The greatest area of ignorance in metal combustion is the identification of reaction products and their properties as a function of temperature and composition of the environment.

OL 1249

Green, A. K., and E. Bauer. "Evolution of Water from Alkali Halide Single Crystals," J APPL PHYS, Vol. 39, No. 6 (May 1968), pp. 2769–73.

ABSTRACT. The evolution of water upon heating in vacuum of NaCl and KCl single crystals which were exposed to controlled humidities for definite time intervals has been studied. Three types of water evolution are observed: (I) a constantly increasing rate of H_2O with increasing temperature attributed to bulk H_2O impurity, (II) desorption peaks which are believed to be connected with a NaOH-hydrate (KOH-hydrate) formation, and (III) bursts which are characteristic of crystals exposed to a saturated-solution vapor pressure.

OL 1250

Hammond, P. R. "Studies on Complexes. Part XI. Acceptor Properties of Some Perhalogenobenzenes," CHEM SOC (London), J, Sec. A (January 1968), pp. 145–52.

ABSTRACT. Suitability of the formula $C_wN_xO_yF_z$ for describing electron acceptor molecules is discussed. New absorptions, many of them associated with colours, of some perhalogenobenzenes with NN-dimethylaniline, NNN'N'-tetramethylphenylenediamine, and tetrakis(dimethylamino)ethylene are ascribed to charge-transfer transitions. In cyclohexane weak 1:1 complexes are formed and ΔG, ΔH, and ΔS values are determined spectrophotometrically. The hexachlorobenzene complexes are stronger than the hexafluorobenzene complexes and their spectra are displaced further into the visible region, although from the positions of the absorptions both acceptors are weaker than nitrobenzene. Chloropentafluorobenzene interactions are anomalous in the series and are discussed in terms of the low symmetry of the acceptor molecule and a preferred orientation in the complex. Close to zero equilibrium constants for the tetra-aminoethylene systems are ascribed to the bulk of the donor.

OL 1251

Hammond, P. R., and R. R. Lake. "Charge-Transfer Interactions of the Highest Valency Halides, Oxyhalides, and Oxides With Aromatic Hydrocarbons and Fluorocarbons: Ball-Plane Interactions," CHEM COMMUN, No. 16 (August 1968), pp. 987–88.

ABSTRACT. Forty-six compounds of the title were examined with respect to the following generalizations: (a) the covalent, highest valency halides, oxyhalides, and oxides are molecules of high electron affinity and demonstrate charge-transfer absorptions with π-donors; and (b) as such donors produce stable complexes only in close, plane-plane combinations, and since the interactions are mostly of the "ball-plane" type, all associations are very weak or just contact. The generalizations are usefully correct; in particular the phenomenon of freezing with colourless, a criterion for simple eutectic phase diagrams, is found to apply to many of the systems examined.

OL 1252

Haseltine, William R. "Existence and Stability Theorems for Exterior Ballistics," SOC IND APPL MATH, CONTRIB, Vol. 6, No. 3 (August 1968), pp. 386–400.

ABSTRACT. The equation governing the yaw of symmetrical projectiles is examined in cases where the yaw of repose is appreciable. The conditions on nonlinear aerodynamic properties are found which permit steady conical yaw and steady epicyclic motion to exist. The stability conditions for these modes are also found by providing a proof of the stability criteria for a degenerate normal system of ordinary differential equations.

OL 1253

Heller, Carl A. "Oxidation and Chemiluminescence of Tetrakis(dimethylamino)-ethylene," in Oxidation of Organic Compounds-I, Advances in Chemistry Series, No. 75. Washington, D. C., American Chemical Society, 1968. Pp. 225–44.

ABSTRACT. When oxygen is removed from a reaction solution of tetrakis(dimethylamino)ethylene (TMAE), the chemiluminescence decays slowly enough to permit rate studies. The decay rate constant is pseudo-first-order and depends upon TMAE and 1-octanol concentrations. The kinetics of decay fit the mechanism proposed earlier for the steady-state reaction. The elementary rate constant for the dimerization of TMAE with $TMAE^{2+}$ is obtained. This dimerization catalyzes the decomposition of the autoxidation intermediate.

OL 1254

Henry, Ronald A. "Preparation and Decomposition of 1-Benziloylimidazole," Note, J ORG CHEM, Vol. 33 (February 1968), pp. 899–900.

ABSTRACT. 1-Benziloylimidazole which can be prepared in satisfactory yield from benzilic acid and 1,1'-carbonyldiimidazole displays many of the normal reactions of 1-acylimidazoles.

When 1-benziloylimidazole is either heated by itself at 145-150° or refluxed in acetonitrile, a rapid and complex decomposition occurs. Carbon dioxide is evolved and imidazole, benzilide, 1-benzhydrylimidazole, 1,3-dibenzhydryiimidazolium benzilate, and low-molecular weight polyester of benzilic acid are formed.

OL 1255

Hightower, J. D., E. W. Price, and D. E. Zurn. "Continuing Studies of the Combustion of Ammonium Perchlorate," in 4th Combustion Conference, Interagency Chemical Rocket Propulsion Group, comp. and ed. by Chem. Rocket Propulsion Information Agency. Silver Spring, Md., CPIA, December 1967. CPIA Pub. No. 162, Vol. 1, pp. 527–34.

ABSTRACT. Data are presented for pure single crystals of ammonium perchlorate (AP), permanganate-doped AP and potassium-doped AP which indicates that the effect of dopants is to raise the low pressure deflagration limit and to decrease the burning rate. It was also conclusively shown that the surface of the self-deflagrating AP consists of a frothy melt which was present due to the high heating rates associated with the self-deflagration, and which seems to be a prerequisite for the sustenance of self-deflagration. The effect of the dopants was to alter the stability of the surface melt and/or the gas phase kinetics.

OL 1256

Hills, M. E., A. L. Olsen, and L. W. Nichols. "Polarization in Cary Model 14 Spectrophotometers and Its Effect on Transmittance Measurements of Anisotropic Materials," APPL OPT, Vol. 7, No. 8 (August 1968), pp. 1437–41.

ABSTRACT. Cary Model 14 spectrophotometers like other prism and grating instruments have polarization characteristics that affect the transmittance values of anistropic or dichroic materials. In the uv, the degree of polarization is fairly constant from 3000 Å to 4000 Å, whereas in the visible, it shows some variation with wavelength. In the near ir, the variation of the degree of polarization with wavelength is large, showing sharply defined maxima at approximately 0.77 μ, 0.97 μ, and 1.27 μ. The spectral transmittance of optical quality sapphire, a uniaxial crystal, cut at 45°, 60°, and 90° to the c axis, showed undulations for certain orientations of the privileged directions.

OL 1257

Jernigan, J. L. "Correlation Technique Using Microwaves," INST ELEC ELECTRON ENG, PROC, Vol. 56, No. 3 (March 1968), p. 374.

ABSTRACT. The technique described uses Brillouin scattering from microwave sound at the Bragg angle to achieve cross correlation. Spatially coherent light waves are phase-shifted in the spatial domain by a phase-modulated pulse train in an acoustic delay cell. These modulated light waves are, in turn, multiplied by a phase plate to produce the desired convolution.

OL 1258

Johnson, W. L. "The Characteristic Function of a Harmonic Function in a Locally Euclidean Space," PACIFIC J MATH, Vol. 23, No. 2 (November 1967), pp. 291–97.

ABSTRACT. The characteristic function for each harmonic function having prescribed singularities in a locally Euclidean space and the class of harmonic functions with bounded characteristics. The main result is that any harmonic function of bounded characteristic can be represented as the difference of two positive harmonic functions with prescribed singularities. Thus the well-known theory of the characteristic functions associated with meromorphic functions has an analogue for harmonic functions in locally Euclidean spaces.

OL 1259

Joyner, T. B. "The Thermal Decomposition of Solid *cis*-Diazidotetraamminecobalt (III) Azide," J PHYS CHEM, Vol. 72, No. 2 (February 1968), pp. 703–07.

ABSTRACT. Solid *cis*-diazidotetraamminecobalt (III) azide resembles the *trans* isomer and azidopentaammine-cobalt (III) azide in showing an ability to decompose to either CoN or a cobalt (II) complex. The CoN reaction has a well-defined induction period followed by a relatively fast decomposition. Kinetic parameters derived from the induction period and the final reaction are in good agreement with each other and with the results from the *trans* isomer and the azidopentaammine. The resemblance extends qualitatively to the more complex cobalt (II) system and is supported by limited rate data. The compound's lability prevents an extensive investigation of the kinetics of this reaction. A substitution reaction to triazidotriamminecobalt (III) has also been detected.

OL 1260

Joyner, T. B. "The Thermal Decomposition of Solid Hexaamminecobalt (III) Azide. The Cobalt (II) Reaction," J PHYS CHEM, Vol. 72, No. 13 (December 1968), pp. 4386–91.

ABSTRACT. The rates of decomposition of solid hexaamminecobalt (III) azide to cobalt (II) complexes have been measured, and the kinetic parameters have been determined. Under low ammonia pressures an apparent activation energy of *ca*. 46 kcal/mol is close to the values obtained for the analogous reactions of azidopentaammine-cobalt (III) azide and *cis*- and *trans*-diazidotetraamminecobalt (III) azide, suggesting a reaction mechanism common throughout the series. Under higher ammonia pressures (50-200 torr), the hexaammine is unique in showing a lower apparent activation energy of *ca* . 32 kcal/mol. This may indicate a reaction path unavailable to the substituted compounds.

OL 1261

Joyner, Taylor B. "The Thermal Decomposition of Solid *trans*-Diazidotetraamminecobalt (III) Azide," J PHYS CHEM, Vol. 71 (1967), pp. 3431–38.

ABSTRACT. Solid *trans*-diazidotetraamminecobalt(III) azide can decompose to either CoN, a cobalt (II) complex, or under limited conditions triazidotriamminecobalt(III). The first two reactions have been studied in detail and found to resemble their counterparts in the decomposition of azidopentaamminecobalt (III) azide. The CoN reaction shows a well-defined induction period followed by a relatively fast decomposition. Kinetic parameters derived from the induction period and the final reaction are in good agreement with each other and the azidopentaammine results. The quantitative resemblance appears to extend to the more complex cobalt(II) system. The two crystal forms of *trans*-diazidotetraamminecobalt(III) azide are similar in their decomposition kinetics.

OL 1262

Kaufman, Martin H., and John Gonzales. "Reinforcement of Fluoroelastomers With Halopolymers," RUBBER CHEM TECHNOL, Vol. 41, No. 2 (March 1968), pp. 527–32.

ABSTRACT. Exploratory development of reinforcing materials for fluoroelastomers has largely been directed toward finding a single reinforcing material which would produce a fluoroelastomer composition having high strength at elevated temperatures. Several fibrous materials, such as polyimides or polyesters, are effective reinforcing ingredients. Teflon powder will, during the milling procedure, coalesce and cold draw into fibers. Thus, with Teflon powder, the conventional mixing procedure results in the formation of reinforcing fibers *in situ*.

Properties of fluoroelastomers reinforced with halopolymer resins, and a possible mechanism of reinforcement are discussed in this paper.

OL 1263

Kelly, H. R. "An Extension of the Woods Theory for Unsteady Cavity Flows," J BASIC ENGR, Vol. 89, Series D, No. 4 (December 1967), pp. 789–806.

ABSTRACT. One of the most useful theories for the design of hydrofoils for use in cavitating flow has been that of L. C. Woods. He solved the linearized problem for a two-dimensional hydrofoil in Helmholtz flow, at zero angle of attack, and tabulated the results. His theory is here extended to include nonzero cavitation number and nonzero angle of attack. The results are tabulated and some are compared with the original Woods theory.

OL 1264

Kraeutle, K. J. "The Decomposition of Crystalline and Granular Ammonium Perchlorate," in 4th Combustion Conference, Interagency Chemical Rocket Propulsion Group, comp. and ed. by Chemical Propulsion Information Agency. Silver Spring, Md., CPIA, December 1967. CPIA Pub. No. 162, Vol. 1, pp. 535–43.

ABSTRACT. The thermal decomposition of ammonium perchlorate (AP) has been investigated applying three different methods. In the first part of the work the isothermal decomposition of ammonium permanganate-doped AP single crystals is reported. Part two gives a description of the surface details of partially decomposed pure AP single crystals. In part three an attempt is made to extend the decomposition studies of AP into the high temperature range to approximately 560°C. Differential thermal analysis (DTA) was applied to the decomposition of granular AP which was sieved into three size fractions.

OL 1265

Krier, H., H. B. Mathes, E. W. Price, and M. Summerfield. "Entropy Waves Produced in Oscillatory Combustion of Solid Propellants," ICRPG/AIAA 3rd Solid Propulsion Conference, 1968. New York, AIAA preprint no. 68-499.

ABSTRACT. The dynamic response of a flat solid propellant flame to an oscillating pressure field was studied experimentally in a window burner fitted to a T-tube rocket motor that served as a pressure oscillator. The burned gas temperature was measured as a function of time (or phase) during a pressure oscillation.

and also as a function of distance from the surface. Such instantaneous measurements of gas temperature, when coordinated with simultaneous measurements of pressure, provide a measure of the entropy content of each element of gas as it flows away from the flame. Since the entropy content of each element of gas is nearly conserved as it flows along, an entropy wave train is formed. It is possible to make deductions regarding the physics of the dynamic burning process by comparing the magnitude and phase of the observed entropy waves with the theoretical values predicted on the basis of a particular flame model. In general, the results show that the temperature of the gas flowing from the combustion zone responds neither isentropically nor isothermally to the pressure. Such responses were assumed in previous publications on the subject. However, on the basis of the KTSS model published recently, the magnitude and phase of the entropy wave are expected to vary in a more complicated form with the imposed frequency and the propellant properties. The observed waves reported in this paper tend to support these KTSS theoretical expectations.

OL 1266

Leipnik, R. B. "A Solution of Pipes's Vehicle-Following Equation Without Lag," TRANSP RES, Vol. 2, No. 3 (September 1968), pp. 279–81.

OL 1267

Liang, C. Y., H. Piller, and D. L. Stierwalt. "Faraday Rotation, Spectral Emittance, and Hall Effect of Gallium Antimonide," APPL PHYS LETT, Vol. 12, No. 2 (15 January 1968), pp. 49–51.

ABSTRACT. Based upon the two-band model, a combined analysis of the experimental data of GaSb obtained from Faraday rotation, spectral emittance, and Hall effect measurement is discussed.

OL 1268

Lovett, J. R. "Determination of Salinity From Simultaneous Measurements of Sound Velocity, Temperature, and Pressure," LIMNOL AND OCEANOGR, Vol. 13, No. 3 (July 1968), pp. 557–59.

OL 1269

Lovett, J. R. "Vertical Temperature Gradient Variations Related to Current Shear and Turbulence," LIMNOL AND OCEANOGR, Vol. 13, No. 1 (January 1968), pp. 127–42.

ABSTRACT. Continuous temperature profile measurements made with the NWC SVTP instrument reveal considerable structure in vertical temperature gradients, including temperature inversions. Some differences in the macrogradients in the California Current are due to dissimilarities between regions of upwelling, surface countercurrent, and current shear. Sharp small-scale gradient changes may possibly be caused by differential currents and two-dimensional Kolmogorov turbulence generated by current shears and dynamically unstable internal waves.

OL 1270

Mallory, H. Dean. "Turbulent Effects in Detonation Flow: Diluted Nitromethane," J APPL PHYS, Vol. 38, No. 13 (December 1967), pp. 5302–06.

ABSTRACT. Pressure irregularities are shown to be present within the wave front in reacting nitromethane-acetone solutions. Throughout the test series described, the reaction wave was overdriven, thereby producing reaction in solutions too dilute to detonate in a normal manner. This device served to produce large pressure irregularities which could easily be seen with our optical system. The irregularities in more dilute nitromethane solutions are several millimeters in lateral extent although quite shallow normal to the wave front. High-speed photographs are presented which show the irregularities to vary with the nitromethane dilution and with the strength of the initiating shock.

OL 1271

Miller, S. A., H. H. Caspers, and H. E. Rast. "Lattice Vibrations of Yttrium Vanadate," PHYS REV, Vol. 168, No. 3 (April 1968), pp. 964–69.

ABSTRACT. The lattice vibrations of YVO_4 have been analyzed group-theoretically, and symmetry coordinates for the vibrations have been constructed. The first-order Raman spectrum is reported in detail and preliminary results of infrared (IR) measurements are given. Six of the seven allowed IR-active modes and nine of the twelve allowed Raman-active modes have been observed. Symmetry assignments are given for all observed modes.

OL 1272

Nelson, L. S., N. L. Richardson, and J. L. Prentice. "Apparatus for the Production and Ignition of Metal Droplets With a Pulsed Laser," Albuquerque, N.M., Sandia (SC-RR-67-3026), December 1967. Also in REV SCI INSTRUM, Vol. 39, No. 5 (May 1968), pp. 744–47.

ABSTRACT. An apparatus is described which forms and ignites single metal droplets in a controlled atmosphere chamber with a single pulse of focused radiation from a Nd-doped glass laser. Before heating, tiny bits of metal—spheres, granules or squares of foil—are

supported in the laser focus either on crossed fibers of the same metal or in an electrostatic levitation device. Photographs of burning droplets at high magnification, complete trajectories, radiant emission histories recorded with a photomultiplier, and time-resolved emission spectra are presented as examples of the information that can be obtained with the apparatus.

OL 1273

Nielsen, Arnold T., and T. G. Archibald. "Displacement of Nitrite Ion from a 1,3-Dinitroalkane in the Formation of an Isoxazoline-2-Oxide," TETRAHEDRON LETT, No. 30 (June 1968), pp. 3375–78.

OL 1274

Nielsen, Arnold T., and Susan Haseltine. "The Base-Catalyzed Intermolecular Condensation of α,β-Unsaturated Ketones. Self-Condensation of Styryl Methyl and Styryl Ethyl Ketones to 5-Aryl-3-styryl-2-cyclohexen-1-ones," J ORG CHEM, Vol. 33 (August 1968), pp. 3264–72.

ABSTRACT. Styryl methyl and styryl ethyl ketones, $ArCH{=}CHCOCH_2R$ (R = H,CH_3), having suitable aryl substituents (methoxy, dimethylamino) undergo self-condensation in aqueous ethanolic sodium hydroxide to 5-aryl-3-styryl-2-cyclohexen-1-ones (6a-d) and 5-aryl-2,4-dimethyl-3-styryl-2-cyclohexen-1-ones (11a-g), respectively. Similarly, 1-(2-methoxyphenyl)-2-methyl-1-buten-3-one undergoes self-condensation to 5-(2-methoxyphenyl)-3-[1-methyl-2-(2-methoxyphenyl)vinyl]-6-methyl-2-cyclohexen-1-one (9). This behavior contrasts with that of styryl alkyl ketones having R groups larger than methyl; they undergo self-condensation to 4-alkanoyl-2-alkyl-3,5-diarylcyclohexanones (3) under the same reaction conditions. Spectral data for all compounds agree with the structural assignments. Retroaldol cleavage of 2,4-dimethyl-5-(2-methoxyphenyl)-3-(2-methoxystyryl)-2-cyclohexen-1-one (11a) by heating in aqueous ethanolic sodium hydroxide at 150° led to 2-methoxybenzyl alcohol and epimeric 5-(2-methoxyphenyl)-2,3,4-trimethyl-2-cyclohexen-1-ones, 12a and b. Equilibration data and nmr spectra suggest that cyclohexenones 11a-f have a *trans* diequatorial C-4 methyl, C-5 aryl configuration. The scope of the reaction is discussed with respect to substituents in the reactant styryl alkyl ketone including number, position, and type of aryl substituents. A comparison is made, with respect to substituents, between the two possible cyclization paths (Michael or aldol) by which the intermediate acyclic olefinic diketone 2 forms cycloalkanones (3) or cycloalkenones (6, 11).

OL 1275

Nielsen, Arnold T., and William J. Houlihan. The Aldol Condensation. New York, Wiley, 1968. 444 pp.

OL 1276

Odencrantz, F. Kirk. "Glycol Contamination in Nucleation Counters," J APPL METEOROL, Vol. 7, No. 3 (June 1968), pp. 522–23.

ABSTRACT. Glycol contamination in ice nucleation counters can reduce the measured value of the nucleation efficiency. This and/or similar contaminants may be responsible for the variation of results observed by different laboratories.

OL 1277

Odencrantz, F. Kirk. "Modification of Habit and Charge of Ice Crystals by Vapor Contamination," J ATMOS SCI, Vol. 25, No. 2 (March 1968), pp. 337–38.

ABSTRACT. Vapor contamination of the atmosphere can produce changes in the crystal habit and the electrical charges produced on growing ice crystals.

OL 1278

Odencrantz, F. Kirk, and Roger W. Buecher. "Temperature-Dependence of the Polarity of Electrical Charges on Ice Crystals," Science, Vol. 158, No. 3798 (13 October 1967), pp. 256–57.

ABSTRACT. The electrical polarity of ice crystals produced from a supercooled cloud is temperature-dependent. The charge polarity appears to be associated with the crystal habit. This phenomenon may be important in precipitation and cloud electrification processes.

OL 1279

Odencrantz, F. Kirk, William S. McEwan, Pierre St.-Amand, and William G. Finnegan. "Mechanism for Multiplication of Atmospheric Ice Crystals: Apparent Charge Distribution of Laboratory Crystals," Science, Vol. 160, (21 June 1968), pp. 1345–46.

ABSTRACT. Replication of ice crystals with vapor of methyl 2-cyanoacrylate has produced evidence of whiskers on them; an additional mechanism for the necessary multiplication of ice crystals in the atmosphere is suggested. This replication technique also confirms crystal clustering in the atmosphere and appears to confirm the distribution of electrical charge on ice crystals.

OL 1280

Palenik, Gus J., Jerry Donohue, and K. N. Trueblood. "The Crystal and Molecular Structure of 3-Nitroperchlorylbenzene," ACTA

CRYSTALLOGR, Vol. B24, Part 9 (September 1968), pp. 1139–46.

3-Nitroperchloryfbenzene forms acicular crystals, with space group $Pbn2_1$ (No. 33). There are four molecules in the unit cell with a = 14•717, b = 10•707, and c = 5•032 Å. The structure was solved from a sharpened three-dimensional Patterson function and refined by Fourier syntheses and full-matrix least-squares methods. The final residual, R, for the 745 observed reflections, measured with a scintillation counter, is 0.066. The benzene ring, with an average C–C distance of 1•380 ± 0•010 Å, is planar but the nitro group is twisted by 13° from this plane. Decreased resonance interaction between the nitro group and the aromatic ring contributes to the long C–N distance of 1.497 Å. The C–Cl distance of 1•786 Å is long compared with a C–Cl bond where the Cl atom is unsubstituted. Large thermal motions in both the nitro and perchloryl groups reduced the accuracy of the bond lengths of N–O, average 1•25 Å, and Cl–O, average 1•45 Å; however, the values in both cases are comparable to the distances found in similar compounds.

OL 1281

Pearson, John. Contributor to Chapters 2 and 4 in High-Velocity Forming of Metals, ed. by E. J. Bruno. Dearborn, Mich., ASTME, 1968.

OL 1282

Porteus, J. O. "Linear Unfolding Methods and Optimization for X-Ray and Similar Spectra," J APPL PHYS, Vol. 39, No. 1 (January 1968), pp. 163–73.

ABSTRACT. The problem of correcting x-ray spectra and similar data for linear smearing or resolution loss, i.e., unfolding, is reexamined with emphasis on accuracy limitations. The advantage of optimum smoothing or filtering in minimizing the effects of experimental uncertainties is demonstrated by comparing three methods when applied to a simple example. The related roles of nonstationarity and the sample span in optimization are considered in detail with reference to such common difficulties as flattening of line peaks, excessive noise in line tails, and spurious oscillations near large changes in spectral intensity. Refinements tending to alleviate these difficulties are discussed, along with ultimate limitations. Also discussed is a means of sampling integrated spectra, which is useful when the unfolding includes a differentiation, as in processing electron energy-loss spectra measured with a retarding field.

OL 1283

Prentice, J. L. "Comments on 'Fundamentals of Combustion of Single Aluminum and Beryllium Particles'," by Andrej Macek, in Bulletin of the Eleventh Symposium (International) on Combustion. Pittsburgh, Pa., The Combustion Institute, 1967. Pp. 215–17.

OL 1284

Prentice, J. L., and L. S. Nelson. "Differences Between the Combustion of Aluminum Droplets in Air and in an Oxygen-Argon Mixture," J ELECTROCHEM SOC, Vol. 115, No. 8 (August 1968), pp. 809–12.

OL 1285

Pringle, J. Kenneth. "Lunar Gravity as a Power Source," presented at the Fifth Annual Meeting, Working Group on Extraterrestrial Resources, Marshall Space Flight Center, Huntsville, Ala. 1–3 March 1967.

OL 1286

Rast, H. E., H. H. Caspers, and S. A. Miller. "Infrared Dispersion and Lattice Vibrations of LaF_3," PHYS REV, Vol. 171, No. 3 (15 July 1968), pp. 1051–57.

ABSTRACT. The infrared spectral emittance of oriented single crystals of LaF_3 has been measured in the range 4–125 μm. Eleven transitions have been identified whose net moments are perpendicular to the optic axis (E_u,x,y), and five additional bands were observed having net moments parallel to the optic axis (A_{2u},z). The data, taken near 4.2, 77, and 373°K, were treated by Kramers-Kronig analysis and by classical oscillator dispersion theory. The results support a crystal structure of $D_{3d}{}^4(P\bar{3}c1)$ which is very slightly distorted from a unit cell of $D_{6h}{}^3(P6_3/mcm)$ symmetry. The infrared results are in good agreement with the results of a recent Raman investigation of LaF_3.

OL 1287

Rast, H. E., H. H. Caspers, and S. A. Miller. "Infrared Spectral Emittance and Optical Properties of Yttrium Vanadate," PHYS REV, Vol. 169, No. 3 (May 1968), pp. 705–09.

ABSTRACT. The infrared spectral emittance E of single scrystals of YVO_4 has been examined near 4.2 and 77°K in the wavelength range 4–125 μm. Of the expected seven active transverse optical modes at K~0, six have been observed and assigned to their symmetry species based on their polarization with respect to the crystalline axes. The observed frequencies of the transverse optic E_u modes were 196, 261, and 788 cm^{-1}; and for A_{2u} modes, 310, 455, and 803 cm^{-1}. The relation between emittance and reflectance, $E = 1 - R$ in the opaque region of lattice vibrations, permits one to determine the reflectance R. By least-square-fitting

the reflectance data to an independent set of damped harmonic oscillators, infrared dispersion parameters were determined for the E_u vibrations.

OL 1288

Schadow, K. "Experimental Investigation of Boron Combustion in Air-Augmented Rockets," New York, American Institute of Aeronautics and Astronautics, 1968. AIAA paper no. 68-634.

ABSTRACT. Studies have been made using a windowed combustion tunnel to examine the mixing and burning between subsonic air and a supersonic fuel-rich exhaust of a rocket motor burning hydrogen-oxygen-boron mixtures. The reaction processes were recorded by high-speed cinephotography. Results of experiments are presented in which the following parameters were varied: (1) boron concentration in the propellant (up to 55% by weight), (2) chamber temperature of the primary rocket (750°K to 2500°K), and (3) air to propellant flow ratio (3 to 15). The temperature of the primary rocket was calculated by assuming boron as a heat sink. These data showed good agreement with the experiments at low chamber temperatures. The strong influence of the primary chamber temperature on the boron combustion efficiency was demonstrated using the results of particle sampling probes and c^*-efficiency measurements. By increasing the chamber temperature from 750°K to 2000°K the overall reaction efficiency was improved from 0.85 to 0.95.

OL 1289

Seraphin, B. O. "Electroreflectance," in Optical Properties of Solids, ed. by S. Nudelman and S. S. Mitra. New York, Plenum Press, 1968.

ABSTRACT. This chapter, based on a lecture at the NATO Advanced Study Institute in Freiburg, 1966, reviews the contributions of electroreflectance to an analysis of the band structure of solids, as of mid-1966.

OL 1290

Shdo, Jose G., Martin H. Kaufman, and Donald W. Moore. "Phenylmagnesium Bromide Induced S_N2' Reaction and Migrations of Fluorine in 1,1-Di(chlorodifluoromethyl)ethylene," J ORG CHEM, Vol. 33 (1968), p. 2173.

ABSTRACT. The reaction of 1,1-di(chlorodifluoromethyl)ethylene with phenylmagnesium bromide leads to a mixture of products. Structural assignments of the isomeric reaction products are discussed as well as a proposed mechanism of their formation.

OL 1291

Slota, P. J., Jr., L. P. Freeman, and N. R. Fetter. "Metal Coordination Polymers. I. Synthesis and Thermogravimetric Analysis of Beryllium Phosphinate Polymers," J POLYMER SCI A-1, Vol. 6 (1968), pp. 1975–90.

ABSTRACT. The preparation, properties, infrared, DTA, and TGA data are given for beryllium dimethyl-, tetramethylene-, di-*n*-butyl-, di-*n*-pentyl-, di-*n*-heptyl-, methylphenyl-, diphenyl-, and bispentafluorophenylphosphinates. Synthesis of dimeric beryllium acetylacetonyl phenyl-[*o*-methylcarboranyl (B_{10})] phosphinate is reported. The beryllium phosphinates were prepared by the reaction of beryllium acetylacetonate with the appropriate phosphinic acid.

OL 1292

Westmacott, K. H. "The Flow-Stress Temperature-Dependence of Quenched Aluminium," METAL SCI J, Vol.1 (1967), pp 177–81.

ABSTRACT. The yield stress and microstructure of aluminium quenched under carefully controlled conditions have been correlated by means of transmission electron microscopy. A strongly temperature-dependent form of hardening has been investigated in detail and shown to be associated with submicroscopic vacancy clusters. These defects are probably the ungrown nuclei of the large dislocation loops that are formed concomitantly. Under certain quenching conditions the hardening data agree with the predictions of Fleischer's theory, suggesting that the nuclei are in a collapsed configuration that produces a tetragonal distortion of the lattice. The significance of these results becomes clear from the unified picture that emerges when they are compared with other quenching studies and with neutron-irradiation hardening.

OL 1293

Westmacott, K. H., R. E. Smallman, and P. S. Dobson. "The Annealing of Voids in Quenched Aluminium and a Determination of the Surface Energy," METALS SCI J, Vol. 2 (September 1968), pp. 177–81.

ABSTRACT. Octahedral voids up to 500 Å in diameter have been produced in thin foils of spectroscopically pure aluminium by quenching. Transmission electron microscopy has been used to investigate the thermal stability of these voids and it is observed that they anneal out rapidly in the range 150–200°C. The kinetics of the annealing is in good agreement with that expected from a diffusion-controlled rate process, and a value for the surface energy $\gamma_M = 1140 \pm 200$ ergs/cm^2 has been obtained.

OL 1294

White, William C., and Arlin J. Krueger. "Shipboard Observations of Total Ozone from 38°N to 60°S," J ATMOS TERREST PHYS, Vol. 30 (1968), pp. 1615–22.

(U) ABSTRACT. Obervations of total ozone from 38°N to 60°S were made during the NASA Mobile Launch Expedition No. 1 aboard the USNS *Croatan*. These are compared with the upper atmospheric meteorological data obtained on the expedition. It was found that total ozone increases markedly south of the demarcation (30°S–35°S) between the high-level easterlies and westerlies. An ozone maximum was located near 47°S in the area where the polar stratosphere begins.

OL 1295

Wieder, H. H., and A. R. Clawson. "Electron Mobility of Sulfur-Doped InSb Films," SOLID-STATE ELECTRON, Vol. 11 (1968), pp. 887–91.

ABSTRACT. The electron mobility μ_F of dendritic donor-doped InSb films, grown by recrystallization from the liquid phase, was investigated as a function of their electron concentration. Sulfur diffused into the indium source material was used to produce variable donor concentrations, up to 7.5×10^{18} cm^{-3}. The results show that $\mu_F = 2/3\ \mu_B$, with μ_B the electron mobility of bulk InSb with the same impurity concentration. An additional scattering mechanism, probably neutral dislocation scattering, is present in films at 295°K, in addition to the polar optical mode and impurity scattering present in bulk InSb.

OL 1296

Wieder, H. H., and D. J. White. "Microwave Magnetoresistance of Dendritic *n*-Type InSb Films," J APPL PHYS, Vol. 39, No. 5 (April 1968), pp. 2401–07.

ABSTRACT. The resistivity ρ_0 and transverse magnetoresistance $(\Delta\rho/\rho_0)$ of dendritic monophase InSb films were measured in the *K*-band microwave region. A theoretical analysis of the propagation of a TE_{10} wave through films covering the cross section of a waveguide was derived subject to the approximation that the resistivity may be treated as a scalar quantity and the attenuation and phase coefficients in the films are equal. It is shown by means of these approximations, good agreement is obtained between the measured dc resistivity and the calculated microwave resistivity. Satisfactory agreement is obtained between the measured dc magnetoresistance, its magnetic field and geometry dependence, and the calculated $(\Delta\rho/\rho_0)$ determined from measurements made in the microwave region.

OL 1297

Williams, E. W., and Victor Rehn. "Electroreflectance Studies of InAs, GaAs, and (Ga, In)As Alloys," PHYS REV, Vol. 172, No. 3 (August 1968), pp. 798–810.

ABSTRACT. The technique of electroreflectance was applied to the study of epitaxial (Ga, In)As alloys. Two experimental methods were used and their relative merits are discussed. The Γ_{15}-Γ_1 and Λ_3-Λ_1 transitions and their spin-orbit splittings were investigated as functions of alloy composition. The spin-orbit splitting at k = 0 for InAs at room temperature was measured directly as 0.446 ± 0.008 eV. The electroreflectance linewidth changes by a factor of 4 for the Γ_{15}-Γ_1 series between InAs and GaAs. The broadening is discussed in terms of mechanisms such as field inhomogeneity and light-hole lifetime for the InAs-rich alloys. The deviations from a linear concentration dependence that were observed for all of the energy gaps were almost all identical and were related to the virtual-crystal model. Transitions below the fundamental gap were correlated with impurities by the use of photoluminescence measurements on the same samples.

OL 1298

Young, P. C. "Identification Problems Associated With the Equation Error Approach to Process Parameter Estimation," presented at the Second Asilomar Conference on Circuits and Systems, 30 October – 1 November 1968.

ABSTRACT. This paper points out some of the basic identification problems associated with the differential equation error method of process parameter estimation. It suggests that a process can be considered fully identifiable in a parametric sense provided: (a) it is activated by a sufficiently exciting input signal; (b) it possesses an augmented state vector whose elements are neither linearly dependent, nor approach linear dependency; and (c) it is controllable and observable in the sense that no pole-zero cancellation is present. In addition, the paper shows that a modified version of multiple correlation analysis can provide a useful, practical procedure for assessing the degree of linear dependence between the elements of the augmented state vector.

OL 1299

Young, Peter C. "Process Parameter Estimation," CONTR AUTOMAT PROG, Vol. 12, No. 125 (November 1968), pp. 931–36.

ABSTRACT. This article reviews classical parameter estimation theory and shows how it can form a useful basis for the identification of dynamic processes from normal operating records.

OL 1300

Young, Peter C. "Regression and Process Parameter Estimation–A Cautioning Message," Simulation, Vol. 10, No. 3 (March 1968), pp. 125–28.

ABSTRACT. This Technical Note outlines some of the limitations of linear regression analysis as applied to process parameter estimation and introduces certain simple procedures that are now available for overcoming them.

OL 1301

Yu, A. Y-C., T. M. Donovan, and W. E. Spicer. "Optical Properties of Cobalt," PHYS REV, Vol. 167, No. 3 (March 1968), pp. 670–73.

ABSTRACT. The optical reflectance of Co has been measured in the spectral range 0.05 eV≤$h\nu$≤11.8 eV. The reflectance is low and decreases monotonically in the region $h\nu$≥0.05 eV, indicating that strong absorption has started at photon energies near or below 0.05 eV. The reflectance has small shoulders at about 3.0, 5.0, and 6.0 eV. Optical functions have been deduced from the reflectance data by the Kramers-Kronig analysis. The $\omega\sigma$ curve exhibits a strong structure at $h\nu$=6.0 eV, similar to the strong peak at $h\nu$=5 eV of $\omega\sigma$ of Ni. The absorption coefficient α of Co also has a prominent peak at $h\nu$=6.0 eV and smaller ones at 3.2 and 5.0 eV. These optical data will be used in a separate paper in conjunction with photoemission results to deduce the optical density of states of Co.

PATENTS

U.S. Patent 3,343,400

Impact Test Apparatus, by J. W. Rogers, Marvin E. Backman, and R. G. Sewell, NWC. 26 September 1967. UNCLASSIFIED.

Test apparatus for attachment to the muzzle end of a high velocity impact test gun for investigating the effects of high velocity impact of a specimen of a given metal against a rigid surface in a sealed gaseous atmosphere.

U.S. Patent 3,343,491

Protective Circuit for Electro-Firing Devices, by Carl I. Peters, Jr., NWC. 26 September 1967. UNCLASSIFIED.

Protective circuit for electro-firing devices which provides substantial immunity to premature or hazardous ignition of electro-firing devices by RF fields or other spurious firing sources.

U.S. Patent 3,351,017

Air-Arming Impact Fuze, by Jack A. Myers, NWC. 7 November 1967. UNCLASSIFIED.

An inertia member is restrained in a "safe" position by a frusto-conical washer which is deformed by a deceleration force, such as the opening of a parachute, permitting the inertia member to move to an "arm" position. Thereafter, the deceleration of impact permits the inertia member to move to "fire" position.

U.S. Patent 3,353,014

Light Bomb, by Rolland Gallup, NWC. 14 November 1967. UNCLASSIFIED.

An improved lightbomb for use in obtaining shadowgraphs and high-speed photographs, i.e., schlieren-type photographs.

U.S. Patent 3,354,828

Emergency Light Unit, by S. Shefler and S. M. Little, NWC. 28 November 1967. UNCLASSIFIED.

An emergency light unit utilizing oxyluminescent compounds to provide illumination in aircraft cabins, cockpits, emergency hatches, etc.

U.S. Patent 3,356,957

Hybrid Amplifier, by D. H. Wheeler, NWC. 5 December 1967. UNCLASSIFIED.

Hybrid amplifier having a saturable-reactor type of amplifier as an input stage in combination with a transistor amplifier and load circuit as an output stage, and wherein the output signal is a train of unidirectional pulses having an average value proportional to the magnitude of a unidirectional input signal.

U.S. Patent 3,360,726

Radiation Responsive Device, by Carl I. Peters, Jr., NWC. 26 December 1967. UNCLASSIFIED.

A method and apparatus for detecting and measuring RF energy.

U.S. Patent 3,362,166

Bipropellant Rocket Combustion Chamber, by Nathan J. Sippel and Herman J. Hoffman, NWC. 9 January 1968. UNCLASSIFIED.

A bipropellant rocket combustion chamber having a plurality of mixing plates made of a variety of materials for their assessment for use in the missile field.

U.S. Patent 3,362,378

Light Extending Product and Process, by Everett M. Bens, NWC. 9 January 1968. UNCLASSIFIED.

A light extended source based on chemiluminescent materials for use in search and rescue on land and sea.

U.S. Patent 3,367,129

Switching Circuit, of a Type Employing a Four-layer Solid State Switching Device, by W. E. Freitag, NWC. 6 February 1968. UNCLASSIFIED.

An electronic on-off switch circuit using a silicon switch semiconductor device, characterized by application of a periodic positive turn-off spike to the cathode terminal across a parallel small valved dropping resistor and a current storage capacitor between the cathode terminal and ground.

U.S. Patent 3,370,519

Method and Means for Removing an Opaque Film of Atmospheric Particles from Before the Lens of a Camera, by Thomas Garcia, Lyman G. Vance, Jr., and Lawrence H. Maschhoff, NWC. 27 February 1968. UNCLASSIFIED.

A protective device for the lens of a camera employed in obtaining photographic coverage of a rocket motor test-firing operation.

U.S. Patent 3,374,865

Snubber and Deploying Lines, by J. M. Craig, NWC. 26 March 1968. UNCLASSIFIED.

Shock absorber for a line disposed between a parachute and a suspended load in which a portion of the line is looped within a plastic deformable tube which compresses in stacked convolutions as the line increases in tension, the convolutions providing increasing frictional resistance against shortening of the loop as the loop ends are pulled from the tube.

U.S. Patent 3,375,148

Pyrotechnics Comprising Silver Iodate, Ammonium Nitrate, Nitrocellulose and Nitrate Esters, by William G. Finnegan and Lohr A. Burkardt, NWC. 26 March 1968. UNCLASSIFIED.

An improved silver iodate containing pyrotechnic which upon combustion on the ground under quiet atmospheric conditions yields active nuclei.

U.S. Patent 3,375,376

Anti-intruder Device, by D. W. Kermode, NWC. 26 March 1968. UNCLASSIFIED.

A transistorized oscillator circuit which responds to internally induced vibration for providing a warning signal varying in both amplitude and frequency in response to man-induced vibration.

U.S. Patent 3,382,803

Fuze, by R. E. Swallow and C. E. Panlaqui, NWC. 14 May 1968. UNCLASSIFIED.

An inertia member is restrained in a "safe" position by a frustoconical washer which is deformed by the opening of a parachute, a spring then moving the weight to an "arm" position. In the event of the parachute snagging a tree or the like, the weight is free to move to "fire" position independent of the rearward pull of the parachute shroud lines.

U.S. Patent 3,383,681

Digital Range Unit, by Kenneth O. Bryant, NWC. 14 May 1968. UNCLASSIFIED.

A digital range unit which provides both range and range rate information in digitized form.

U.S. Patent 3,396,170

Aluminum Hydride Tetrazole Complexes and Synthesis Thereof, by Neil R. Fetter and Bodo K. W. Bartocha, NWCCL. 6 August 1968. UNCLASSIFIED.

A process for the preparation of aluminum hydride tetrazole complexes comprising adding a member selected from the group consisting essentially of

aluminum hydride etherate and aluminum hydride trimethylamine to a member selected from the group consisting of 2-methyltetrazole, 2-ethyltetrazole, 5-ethyltetrazole, 2-methyl-5-vinyltetrazole, 2-ethyl-5-aminotetrazole, 1-alkyl-5-aminotetrazole, and 2-methyl-5-cyanotetrazole at a reaction temperature ranging from 0° to -196°C, warming to room temperature, and stirring for about 30 minutes until a precipitate forms.

An aluminum hydride complex with a member selected from the group consisting of 2-methyltetrazole, 2-ethyltetrazole, 5-ethyltetrazole, 2-methyl-5-vinyltetrazole, 2-ethyl-5-aminotetrazole, 1-alkyl-5-aminotetrazole, and 2-methyl-5-cyanotetrazole.

U.S. Patent 3,396,197

Heptafluoropropyl Diphenylphosphine and the Preparation Thereof, by Clay M. Sharts, NWCCL. 6 August 1968. UNCLASSIFIED.

This invention describes heptafluoropropyl diphenylphosphine which is useful in endcapping azide-terminated polymers derived from diazides such as diazidohexaphenylphosphonitrile tetramer and bis-phosphines. Endcapping is important to achieve the maximum chemical and thermal stability in the polymers formed from diazides and bis-phosphines. Heptafluoropropyl diphenylphosphine is a superior endcapping group because of the added stability of the heptafluoropropyl group.

U.S. Patent 3,402,631

Polarized Light Reflectometer, by Roy F. Potter, NWCCL. 24 September 1968. UNCLASSIFIED.

This invention relates to the measurement of polarized light reflection characteristics of a sample substance, and more particularly to a reflectometer device whose configuration permits merely the sample and mirrors to be moved during the adjustments for various data points rather than the necessity of moving the source, polarizer, detector and the accompanying electrical connections, thus permitting the use of larger and more sophisticated components.

U.S. Patent 3,402,734

Balanced Piston Relief Valve, by Roland W. Robbins, Jr., NWC. 24 September 1968. UNCLASSIFIED.

Annular poppet relief valve surrounding a central pilot valve and having a metering orifice to pressurize the rear face of the poppet valve. When the pilot valve moves in response to relief pressure, it relieves the pressure on the rear face of the poppet valve, and system pressure acting on its front face causes it to open.

U.S. Patent 3,413,455

Analog Square Root Computer Using Hall Generator, by Harry H. Wieder and David A. Collins, NWCCL. 26 November 1968. UNCLASSIFIED.

A semiconductor Hall generator is used in conjunction with additional devices and circuitry to obtain an electrical output signal proportional to the square root of an applied input potential. The circuit is of importance for analog computers which may be the sum of the squares of any arbitrary junctions.

U.S. Patent 3,413,457

Analog Ratio Computer Using Hall Generator, by Harry H. Wieder, NWCCL. 26 November 1968. UNCLASSIFIED.

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